STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

STAFF SUBMITTAL

for the meeting of the
COMMISSION ON WATER RESOURCE MANAGEMENT

April 29, 2015
Lihue, Kauai

University of Hawaii / U.S. Army Garrison Hawaii
REQUEST FOR WELL CONSTRUCTION VARIANCE
PTA Test Well 2 (Well No. 4738-001)
TMK (3) 6-7-001:041, Island of Hawaii

APPLICANT:
University of Hawaii, Hilo
CSAV, 200 W Kawili St.
Hilo, HI 96720

LANDOWNER:
U.S. Army Garrison Hawaii
U.S. Army COE, Honolulu District
Building 230
Fort Shafter, HI 96858

SUMMARY OF REQUEST:

As long as an applicant complies with the Commission's 2004 Hawaii Well Construction and Pump Installation Standards, well permits are approved administratively. In this instance, the applicant is seeking a variance to reduce the required minimum annular space between the borehole and the well casing, from 1.5" to 0.75", and the 70%/500 feet sanitary seal requirement for the proposed PTA Test Well 2 in the Anaehoomalu Aquifer System Area (AASA). This variance from the standards requires Commission action.

DESCRIPTION:

Location: (See Exhibit 1)

Dimensions: (See Exhibit 2)

BACKGROUND:

Hawaii Well Construction and Pump Installation Standards

The Hawaii Well Construction and Pump Installation Standards (HWCPIS), Revised February 2004, describes the minimum requirements for the construction of wells and installation of pumps.

The "annular space" is the void between the drilled borehole and the installed well casing. The sealing of this space is important because it is a potential conduit for contamination to reach the aquifer if it is not properly sealed. Also, unsealed annular space could allow cross connection(s) between aquifers (perched to basal, basal artesian to caprock, saltwater to basal, etc.).

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HWCPIS 2004 Section 2.6(c) states:

> *To prevent surface contamination, the annular space of all cased non-artesian wells must be sealed with grout from the ground surface to a minimum depth of 500 feet or 70% of the vertical distance between the ground surface and the top of the aquifer selected for exploration, long-term monitoring, or development, whichever depth is less. Wells drilled to artesian (confined) aquifers shall be grouted and cased so that leakage does not occur into overlying or underlying formations. Salt-water wells shall be grouted through the entire fresh and brackish portion of the basal lens. Perched aquifers above the target aquifer must be cased and grouted off.*

Further, Section 2.6(d) states:

> *The annular space of wells to be grouted must be a minimum of one and one[-]half inches all around the maximum dimension of the casing if the grout is placed by positive displacement. If positive displacement is not used the minimum annular space is two inches for all wells except public water supply wells. Public water supply wells are required to have a three inch annulus if the positive displacement technique is not used.*

Timeline for application

On November 4, 2013, the Commission received an application for this scientific test well (PTA Test Well 2) and subsequently assigned it well number 4738-001. The purpose of this well is to follow up on the results from the PTA Test Well 1 (State Well No. 4532-002) to verify the extent of high-level water in the saddle road area.

The PTA Test Well 2 application was not accepted as complete because of outstanding issues with the applicant's previous, PTA Test Well 1. PTA Test Well 1 was installed in a vault because of concerns for vehicular traffic in the area of the wellhead. The HWCPIS require the wellhead casing to terminate 2 feet above the ground surface to minimize potential contamination that could occur from floods or if contaminants collect within a vault below grade that can then flow down the well casing. If vehicular traffic is a concern short vertical posts called bollards should be installed. Staff required this correction to take place prior to officially accepting the PTA Test Well 2.

On February 26, 2015, staff pre-routed the application to various agencies for review comments without officially accepting the application. The Department of Health's Clean Water Branch commented that an NPDES permit would be required for discharge from drilling activities.

On April 21, 2015, staff met with the applicant, Dr. Donald Thomas, PhD, to confirm the PTA Test Well 1 vault fix. Dr. Thomas provided photographs showing that the PTA Test Well 1's well head met the HWCPIS as of April 20, 2015.

Dr. Thomas also requested and discussed possible ways to begin construction immediately on PTA Test Well 2 and the variance to the minimum annular space and sanitary seal depth requirements. As of the writing of this submittal, staff is intending to issue a well construction permit that limits the drilling to 200' to allow Dr. Thomas to immediately start construction on the upper 200' portion of the well that is in compliance with the HWCPIS 2004.

ISSUES/ANALYSIS:

An approved variance would allow only a 230' sanitary seal and a 0.75" annular space in portions of the well bore below 230' depths. The concern with a reduced sanitary sealing depth and annular space is that grout may not fully fill the annular space to protect the aquifer(s) from contamination and aquifer cross-connection.

The construction of this well is unconventional. Dr. Thomas intends to drill the hole via continuous coring, rather than a conventional rotary drill rig. Coring is a drilling method that maintains the original structure of the rock for extraction to get an accurate well profile of the underground geology. It is more time consuming, expensive, and requires specialized equipment to do. The workers employed to do the work were the previous owners of the specialized rig and are licensed in Minnesota & Canada. The coring rig used doesn't allow borehole sizes to the proposed required depths while achieving the required 1.5" annular space (see Exhibit 2).

It was discovered after the submission of the PTA Test Well 1 well completion report that in addition to the vaulting issue that the annular spacing did not meet HWCPIS 2004 Section 2.5(d) despite this being flagged as a special condition in the permit. Though the well completion report for PTA Test Well 1 claims the inadequate annular spacing has been grouted, staff has not accepted the well completion report to date and continues to discuss alternatives including proper sealing the PTA Test Well 1.

It is difficult to accurately predict where perched aquifers might be found. According to earlier geophysical studies by Dr. Thomas & Herbert Pierce (USGS Open File Report 2009-1135) there was no compelling evidence of perched ground water above 4000-5000 ft. mean sea-level (msl). However, at least one (possibly two) perched aquifers were encountered during the drilling of PTA Test Well 1. For illustrative purposes the conditions found in the previously drilled well can provide a basis for the proposed variance conditions that may be encountered at PTA Test Well 2 (see Exhibit 2 for the proposed well section).

The concerns of an inadequately sealed annulus can be addressed by the following provisions:

a) Some grout that is used to fill the space between the 7" casing and the 4.5" casing will fill some of upper annulus, providing an annular seal depth greater than the 230'.

b) After placement of the casing, the perched saturated zones can be isolated by perforating the casing and pumping grout into the annulus from inside the casing.

c) The bottom of the 4.5" casing annular space can be grouted by positive displacement.

Although the design of this well will not conform to the HWCPIS 2004 requirement for the 1.5" minimum annular space, and as a result depth of grouting will be inadequate, staff feels that the above provisions will minimize the potential for contamination and/or aquifer cross-connections. Staff requests to be given adequate notice in order to be present during these various grouting events to verify the outcome of these proposed efforts. This test hole can be abandoned and sealed should the proposed sealing efforts prove difficult or uncertain.

RECOMMENDATION:

Staff recommends the Commission approve the variance of HWCPIS 2.6(c) and (d), subject to the following conditions:

a) The 9 5/8" casing and the 7" casing shall be grouted without variance, ensuring the first 230' are adequately grouted.

b) Perched aquifer(s) encountered shall seal the annulus by perforating the casing below the bottom of the perched aquifer and grouting the annulus under positive displacement.

c) The bottom of the solid casing shall be sealed using positive displacement.

d) The applicant shall give Commission staff a two week notice prior to any grouting activities, to allow staff to observe grout placement.

e) If the applicant fails to achieve the goals of proper sanitary and annular sealing through these variances by April 29, 2017, the applicant shall apply for a well abandonment permit and seal the well.

Respectfully submitted,

W. ROY HARDY
Acting Deputy Director

Exhibits:
1. (Location Map)
2. (Proposed Well Section)

APPROVED FOR SUBMITTAL:

CARTY S. CHANG
Interim Chairperson

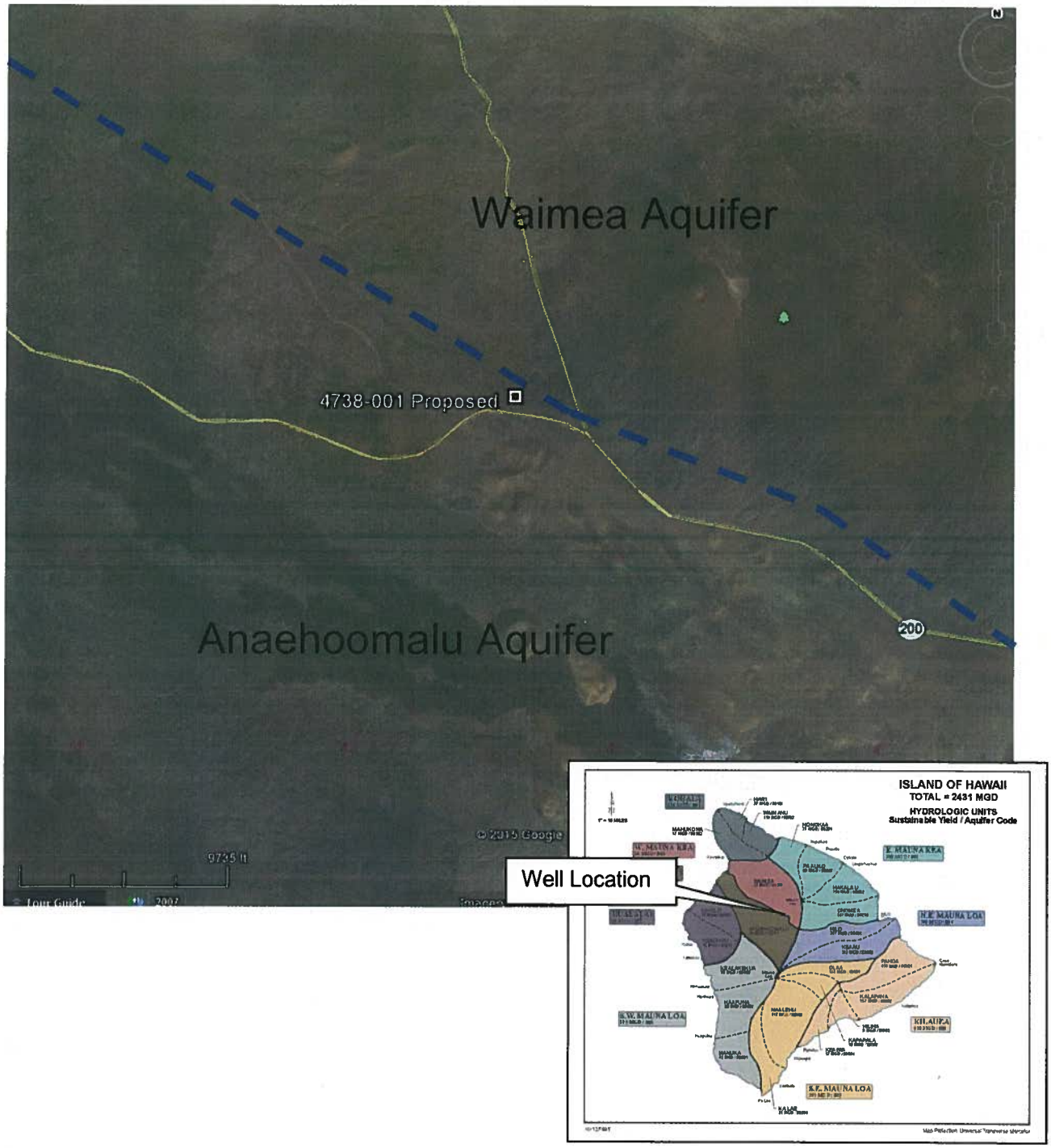

EXHIBIT 1 – LOCATION MAP

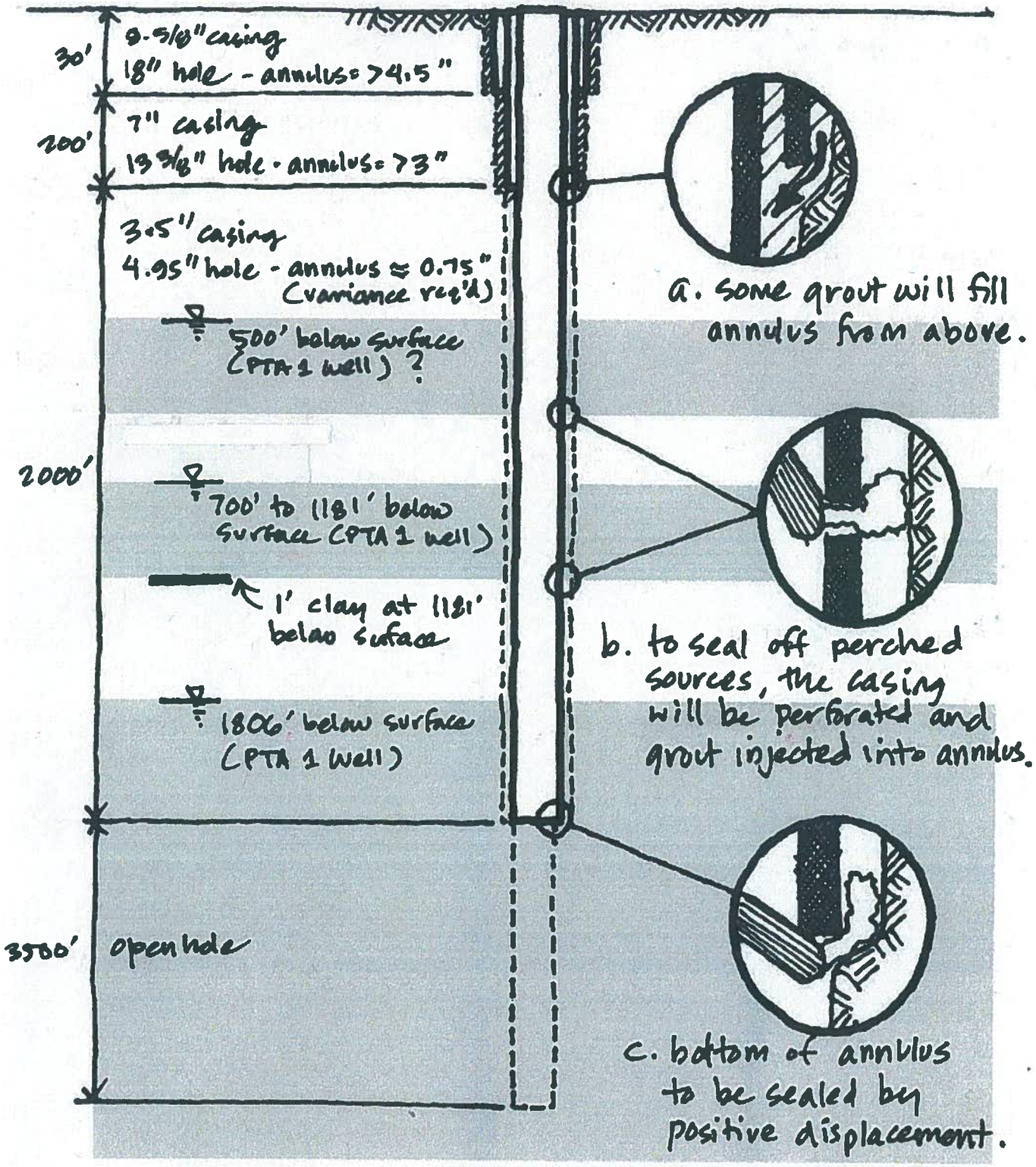

EXHIBIT 2 – PROPOSED WELL SECTION